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NOTES FROM PACIFIC COAST OBSERVATORIES.

SOME RESULTS OF A STUDY OF THE STRUCTURE OF PHOTOGRAPHIC FILMS.[1]

It is well known that the discordances found between the positions of stars on different photographs, or of different images on the same photograph, are much greater than the errors of measurement alone. Could such discordances be eliminated, the gain in the accuracy of positions derived from photographs would be very great.

In my work on the development of methods for deriving stellar parallaxes by photography, this matter of erratic discordances has seemed of first importance, and I have made a study of it.

There are several possible sources for these discordances:—

1. Distortions of the photographic film.
2. Peculiarities of the telescope, including its driving mechanism, seeing, etc.
3. The structure of the image formed in the film.

The distortions of the film have been investigated by a number of astronomers with the result that such distortions appear to be small and not to account for the large discordances which occur in practice. My own investigations on distortion confirm this opinion, and indicate that they are of the order of magnitude of the uncertainties of measurement.

I then adopted a plan which at once eliminated all of the conditions of source 2 and threw the responsibility on source 3. It was to copy on the same plate a number of images of the

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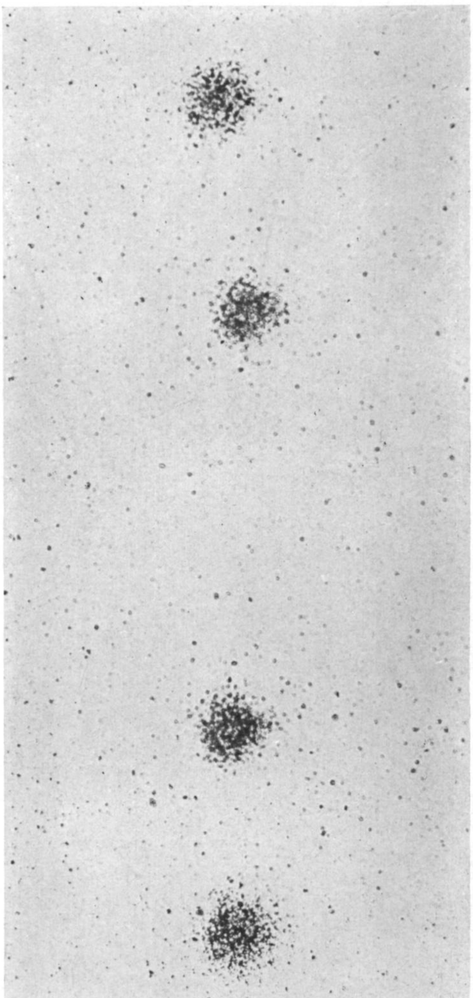
[1] Abstract from *Lick Observatory Bulletin*, No. 143.



artificial stars on a pattern plate. The different images were obtained by successive exposures to the pattern plate, shifting the pattern plate a little between exposures. It will be seen that the resulting images should be exactly alike, and that the distances between them should agree exactly, if there is no distortion of the film or no irregularities in form of the images.

Measures of distances made on these laboratory plates showed discordances similar in magnitude to those made on actual star-plates.

The form and structure of the images on the laboratory plates were next examined under a microscope. It was found that instead of being round and exactly alike, as they should have been, the images were quite irregular in form, the irregularities being great enough to cause such discordances as those observed.

These irregularities of form appear to result from vacancies in the gelatine where there are no silver grains. If the exposure is sufficiently prolonged, the star-image is opaque in the center, but there is a surrounding penumbra where these vacancies show. It is my belief that these irregularities of structure are the chief source of the large discordances now found in measures of photographic star-positions. There are also some distortions of the film, but these appear to be small. At any rate, the structure of the film should be made so uniform that we can obtain successive images of a pattern star which agree with one another. Then we shall be in a better position to investigate the actual distortions.

The illustration herewith is an enlargement to 150 diameters of four images copied by successive contact exposure from a single image on a pattern plate. These four images should all be alike, except for such changes as are introduced by the grain and structure of the film on which the copies are made.

It is entirely possible that an increase in the amount of silver in the film will eliminate most of the trouble. A division into finer grains of the silver now present in films should also help materially.

One of our largest dry-plate manufacturers is now experimenting in the direction of improving the structure of the film, and it is hoped that his efforts will be early successful. One of the most encouraging results of these investigations is the apparent freedom of the positions from errors due to the telescope and seeing.

C. D. PERRINE.

MT. HAMILTON, CAL., September 26, 1908.

THE ORBIT OF THE EIGHTH SATELLITE OF *JUPITER*.

From observations extending from January 27th to April 29th of this year, we have derived a set of osculating elements of the orbit of *Jupiter's* eighth satellite, which was discovered last January by MELOTTE at Greenwich. The results show that the motion is retrograde, the inclination of the orbit plane to the equator being about 146°. The orbit is quite eccentric, ϕ being 26°. The satellite's mean distance from *Jupiter* is 0.18 (astronomical units). The periodic time about *Jupiter* is two and a half years.

The osculating elements were derived by LEUSCHNER'S "Analytical Method of Determining the Orbits of New Satellites," which was used here with success in determining the orbit of the seventh satellite. The computation was based upon the supposition that *Jupiter* is the primary and the Sun is the principal disturbing body. This method then gives the osculating orbit for the middle date used (March 8th), in which the attraction of the Sun as a disturbing body during the period covered by the observations (January 27th-April 29th) is fully taken into account.

An ephemeris based upon these osculating elements and the perturbations due to the Sun, computed by ENCKE'S method as adapted to this problem by LEUSCHNER, is in preparation.

R. T. CRAWFORD,
W. F. MEYER.

BERKELEY ASTRONOMICAL DEPARTMENT,
September 23, 1908.

NOTE ON COMET *c* 1908.

Comet *c* 1908 was discovered by Professor MOREHOUSE at the Yerkes Observatory on September 1st.

Two orbits of this comet have been computed at the Students' Observatory. The second set of elements and an ephemeris may be found in *Lick Observatory Bulletin,* No. 139.